L Number	Hits	Search Text	DB	Time stamp
1	1	jp-2001228310-$.did.	JPO	2003/04/26 13:53
2	12359	circular$3 near5 polariz$3	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 13:54
3	8284	cholesteric	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 13:58
4	509	(circular$3 near5 polariz$3) near10 cholesteric	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 13:58
5	29771	349$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 13:58
6	276	((circular$3 near5 polariz$3) near10 cholesteric) and 349$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 13:58
7	365514	light adj source	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 13:59
8	66	((circular$3 near5 polariz$3) near10 cholesteric) same (light adj source)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 14:00
9	35	349$.ccls. and (((circular$3 near5 polariz$3) near10 cholesteric) same (light adj source))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/26 14:00

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The diffusion sheet with which the phase contrast value within a field is characterized by 70nm or more being 160nm or less.
[Claim 2] The diffusion sheet according to claim 1 which makes transparent polymeric materials a base material.
[Claim 3] The diffusion sheet according to claim 2 whose rate of haze is 95% or less 30% or more.
[Claim 4] Light equipment with which a reflective sheet, the light guide plate with which the light source has been arranged at the edge, and the diffusion sheet whose phase contrast value within a field is 70nm or more 160nm or less are arranged at this order, and are characterized by the bird clapper.
[Claim 5] Light equipment with which it comes to arrange a reflective sheet, the light guide plate with which the light source has been arranged at the edge, and a diffusion sheet at this order, and the phase contrast value within a field of the layered product of this light guide plate and this diffusion sheet is characterized by 70nm or more being 160nm or less.
[Claim 6] Polarization light equipment which a reflected type linearly polarized light element is arranged, and is characterized by the bird clapper so that ****** may cross the diffusion sheet side of light equipment according to claim 4 or 5 at the lagging axis of the layered product of this light guide plate and this diffusion sheet, and 40-degree or more angle of 50 degrees or less.
[Claim 7] Furthermore, polarization light equipment according to claim 6 with which the dichroism polarizing element is arranged with this diffusion sheet of this reflected type linearly polarized light element so that the ****** may be in agreement with an opposite side with ****** of this reflected type linearly polarized light element.
[Claim 8] The liquid crystal display with which a liquid crystal cell and a front-face side dichroism polarizing element are arranged in this order by the polarizing-element side of polarization light equipment according to claim 6 or 7, and are characterized by the bird clapper at it.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to a liquid crystal display and suitable polarization light equipment to use for it, light equipment, and a diffusion sheet.
[0002]
[Description of the Prior Art] Small and since it is lightweight, the liquid crystal display is used in various fields. If a common liquid crystal display is explained based on drawing 2 , this liquid crystal display 11 will be changing electrically the orientation state of the liquid crystal molecule in a liquid crystal cell 20, and will control the polarization state of the light which passes through that. Two transparent electrodes 21 to which a liquid crystal cell 20 usually counters, i.e., the transparent electrode by the side of a tooth back, and the transparent electrode 22 by the side of a front face, It consists of a liquid crystal layer 23 pinched among these transparent electrodes 21 and 22. in the front face The front photometry study elements 30, such as the front-face side dichroism polarizing element 35 which detects the polarization state of the light which penetrated the liquid crystal cell 20, and the front-face side phase contrast element 36, are arranged, and only a specific polarization light is taken out in a tooth back, and the polarization light equipment 42 for carrying out outgoing radiation towards a liquid crystal cell 20 is arranged at it. This polarization light equipment 42 consists of diffusion sheets 71 arranged between the optical elements 51 arranged at the tooth back of a liquid crystal cell 20, such as the dichroism polarizing element 55 and the phase contrast element 56, the light guide plate 62 which has been arranged at the tooth-back side and has arranged the light source 61 to a lower part or the side, its reflecting plate 63 arranged further back, and a liquid crystal cell 20 and a light guide plate 62. In this polarization light equipment 42, since the dichroism polarizing element 55 functions as a filter which penetrates only a polarization light required of absorbing an unnecessary polarization light, even if it is in an ideal state, 50% of light is absorbed and light is not used effectively to the natural light which is in the state where it does not polarize.
[0003] Then, the way arrange a reflected type polarizing element to a light source side rather than the dichroism polarizing element 55, reflect in advance the polarization light of the oscillating direction absorbed by the dichroism polarizing element 55, use light effectively by returning and recycling in a light source side, and the same power consumption also raises the screen intensity of a liquid crystal display is Provisional Publication No. It is proposed by 63 No. -168626 official report. Since the light reflected by the reflected type polarizing element which consists of a grid polarizer is recycled effectively, using a quadrant wavelength plate is indicated by this official report, and, specifically, the example which has arranged the diffusion board at the tooth back of a reflected type linearly polarized light element, and has arranged the quadrant wavelength plate and the mirror in this order at the tooth back from it further is shown in it. In order to make the mechanism which makes this official report rotate 90 degrees of plane of polarization of the reflected light by the reflected type linearly polarized light element of a publication discover, the phase contrast value within a field of a diffusion board needs to be zero, and the light guide plate which has the phase contrast within a field cannot be used. Therefore, if it was polymeric materials, since processing of annealing-izing would be needed after formation by the cast method and use of a light guide plate would be restricted as a diffusion board, using the inorganic material which phase contrast, such as a glass plate, does not discover, the technical problem occurred in respect of thickness, a weight, a production cost, etc.
[0004]
[Problem(s) to be Solved by the Invention] light-gage [for the technology which this invention raises and has the use efficiency of the light of polarization light equipment under such circumstances using a reflected type polarizing element, and raises the screen intensity of a liquid crystal display / suitable] -- it can be lightweight, it can produce cheaply, the diffusion sheet which can be further contributed also to the improvement in screen intensity of a liquid crystal display is offered, and the light equipment, the polarization light equipment, and the liquid crystal display to which the principle was applied further are offered, and suppose like
[0005] In the polarization light equipment with which this invention person raised the use efficiency of light using the reflected type linearly polarized light element, or the liquid crystal display which raised screen intensity By limiting the phase contrast value within a field of the diffusion sheet used there to a certain within the limits, or limiting the phase contrast value within a field of the layered product of a diffusion sheet and a light guide plate to a certain within the limits While the thinning of a diffusion sheet and lightweight-ization were attained, it found out that it could produce cheaply and could contribute also to much more increase in efficiency of the optical use in polarization light equipment, and much more improvement in brightness of a liquid crystal display, and resulted in this invention.

[0006]
[Means for Solving the Problem] Namely, as for the diffusion sheet concerning this invention, the phase contrast value within a field is characterized by 70nm or more being 160nm or less. As for this diffusion sheet, what makes transparent polymeric materials a base material is advantageous. As for the diffusion sheet which makes such transparent polymeric materials a base material, it is desirable that the rate of haze is 95% or less 30% or more.
[0007] From one standpoint, a reflective sheet, the light guide plate with which the light source has been arranged at the edge, and the diffusion sheet whose above-mentioned phase contrast value within a field is 70nm or more 160nm or less are arranged at this order, and the light equipment concerning this invention is characterized by the bird clapper. Moreover, it comes to arrange a reflective sheet, the light guide plate with which the light source has been arranged at the edge, and a diffusion sheet at this order, and, as for the light equipment specified from another standpoint, the phase contrast value within a field of the layered product of a light guide plate and a diffusion sheet is characterized by 70nm or more being 160nm or less.
[0008] A reflected type linearly polarized light element is arranged, and the polarization light equipment furthermore applied to this invention is characterized by the bird clapper so that ****** may cross the diffusion sheet side of the light equipment of one of the above at the lagging axis of the layered product of the above-mentioned light guide plate and a diffusion sheet, and 40-degree or more angle of 50 degrees or less. In this polarization light equipment, to an opposite side, with the diffusion sheet of the above-mentioned reflected type linearly polarized light element, a dichroism polarizing element can also be arranged so that the ****** may be in agreement with ****** of the above-mentioned reflected type linearly polarized light element.
[0009] Moreover, according to this invention, the liquid crystal display using such polarization light equipment is also offered, a liquid crystal cell and a front-face side dichroism polarizing element are arranged in this order at the polarizing-element side of the above-mentioned polarization light equipment, and this liquid crystal display is characterized by the bird clapper.
[0010]
[Embodiments of the Invention] Drawing 1 is the cross section showing typically an example of the liquid crystal display concerning this invention, and gives outline explanation of this whole liquid crystal display composition based on this drawing first. This liquid crystal display 10 consists of polarization light equipment 40, a liquid crystal cell 20, and a front photometry study element 30 containing the front-face side dichroism polarizing element 35 fundamentally. In this example, the laminating of the front-face side dichroism polarizing element 35 is carried out to the front-face side phase contrast element (phase contrast film) 36, and it has the composition that the phase contrast element 36 side has been arranged at the front-face side of a liquid crystal cell 20.
[0011] And polarization light equipment 40 consists of light equipment 45 with which it comes to arrange the reflective sheet 63, the light guide plate 62 with which the light source 61 has been arranged at the edge, and the diffusion sheet 70 at this order, and an optical element 50 containing the reflected type linearly polarized light element 53 arranged at the diffusion sheet 70 side fundamentally. With the front-face side of the reflected type polarizing element 53, i.e., the field in which the diffusion sheet 70 is located, the dichroism polarizing element 55 is arranged at an opposite side, the phase contrast element 56 is arranged further at the front-face side, and the optical element 50 consists of this example. In order to be efficiently scattered on the tooth back of a light guide plate 62 and to reflect the light from the light source 61 in it, usually white dot printing 64 etc. is given.
[0012] this invention is related to the liquid crystal display 10 equipped with such a reflected type linearly polarized light element 53, or the polarization light equipment 40 which is the component part. this invention is related also to the light equipment 45 or the diffusion sheet 70 which is the component part of this polarization light equipment 40 again. And in this invention, the phase contrast value within a field of the diffusion sheet 70 or the phase contrast value within a field of the layered product 80 of it and a light guide plate 62 becomes important.
[0013] Generally the diffusion sheet 70 is the member of the shape of a sheet which carries out diffuse transmission of the beam of light, and the phase contrast value within a field of this diffusion sheet 70 is specified in the 70nm or more range of 160nm or less from one standpoint in this invention. It is specified that the phase contrast value within a field of the layered product 80 of a light guide plate 62 and the diffusion sheet 70 serves as the 70nm or more range of 160nm or less from another standpoint in this invention. Moreover, it is much more effective to adjust using the diffusion sheet 70 whose phase contrast value within a field is 70nm or more 160nm or less, as the layered product 80 of this and a light guide plate 62 shows the phase contrast value within a field of 70nm or more 160nm or less.
[0014] Here, it is the diffusion sheet 70 or the phase contrast value within a field of the layered product 80 of a light guide plate 62 and the diffusion sheet 70 has the desirable one where the wavelength which makes the improvement effect in brightness discover by the reflected type linearly polarized light element 53 is nearer 1/4 time. For example, if the wavelength region which makes the improvement effect in brightness discover is a visible wavelength region, it is desirable to have a phase contrast value within a field near 138nm as 1/4 time to the highest green wavelength (about 550nm) of visibility. That is, as for the diffusion sheet 70 or the phase contrast value within a field of a layered product 80, it is desirable that it is [100nm or more] 150nm or less, and it is more desirable that they are especially 120nm or more and 140nm or less 110 morenm or more. On the other hand, in order to prevent brightness nonuniformity, as for the variation in the phase contrast value within a field of the diffusion sheet 70, it is desirable that it is 40nm or less, and it is much more desirable that it is especially 10nm or less 20 morenm or less.
[0015] Although especially the quality of the material of the diffusion sheet 70 is not limited but various well-known material can be used, what makes transparent organic polymeric materials a base material is one of the desirable gestalten from the ease of the thinning of a diffusion sheet, lightweight-izing, and handling. Especially the quality of the material of a transparent macromolecule is not limited, for example, can use naturally-ocurring polymers, such as synthetic macromolecules, such as polyethylene, polypropylene, a polyvinyl chloride, a polyethylene terephthalate, polyethylenenaphthalate, a polycarbonate, a

norbornene resin, polyurethane, a polyacrylate, and a polymethylmethacrylate, a diacetyl cellulose, and a cellulose triacetate. As for these transparent polymeric materials, it is desirable that it is colorlessness. Moreover, these polymeric materials can contain additives, such as an ultraviolet ray absorbent, and an antioxidant, a plasticizer, if needed.

[0016] In order to manufacture a diffusion sheet from these transparent polymeric materials, one side or the both sides of a method and a transparent macromolecule sheet front face which give the layer containing a dispersing agent to one side or the both sides of a method and a transparent macromolecule sheet front face which make a dispersing agent contain can be used combining two or more sorts of methods, respectively into a transparent macromolecule sheet, using various well-known methods, such as the method of split-face-izing, independently. What is necessary is to knead the dispersing agent beforehand in the transparent polymeric materials used as a base material, and just to fabricate it in the shape of a sheet by the cast method or the extrusion method, in adopting the method of making a dispersing agent containing, into a transparent macromolecule sheet. When adopting the method of giving the layer containing a dispersing agent to one side or the both sides of a transparent macromolecule sheet front face, first, transparent polymeric materials are fabricated in the shape of a sheet by the cast method or the extrusion method, subsequently to resin liquid, coating of what distributed the dispersing agent is carried out on a transparent macromolecule sheet, it can dry or harden and resin liquid can be manufactured. When adopting the method of split-face-izing the front face of a transparent macromolecule sheet, first, a transparent macromolecule is fabricated in the shape of a sheet by the cast method or the extrusion method, and subsequently a front face can be split-face-ized by the mold push method and the sandblasting method with an embossing roll, and it can manufacture. Even when adopting which method, in order to reduce the variation in the phase contrast value within a field, it is desirable to form a sheet by the cast method.

[0017] Here, especially if it is a colorless or white particle as a dispersing agent, it is not limited but both an organic particle and an inorganic particle can be used. As an organic particle, the particle which consists of high molecular compounds, such as a polyolefine system resin like polystyrene, polyethylene, or polypropylene and an acrylic resin, for example may be a macromolecule over which the bridge was mentioned and constructed. Furthermore, two or more sorts of monomers chosen from ethylene, a propylene, styrene, a methyl methacrylate, benzoguanamine, formaldehyde, a melamine, a butadiene, etc. can also use the copolymer which comes to carry out copolymerization. As an inorganic particle, particles, such as a silica, silicone, and titanium oxide, may be mentioned, and you may be a glass bead, for example.

[0018] As resin liquid used for the method of carrying out coating of the thing which made resin liquid distribute a dispersing agent on a transparent macromolecule sheet, a solvent volatilization type or water volatilization type resin liquid, and a heat-hardened type or optical hardening type resin liquid can be used. as a solvent volatilization type or water volatilization type resin liquid -- macromolecules, such as a polyacrylate, a polymethacrylate, a polyvinyl chloride, polyvinyl acetate, a cellulose, and synthetic rubber, -- organic solvents, such as alcohols like a methanol, ethanol, propanol, and an isopropanol, cellosolves like a methyl cellosolve or ethylcellosolve, an aromatic system solvent like toluene or a xylene, ethyl acetate, and a methylene chloride, -- or the thing which water was made to dissolve or distribute can be used When coating of these volatilized type resin liquid is carried out on a transparent macromolecule sheet, a coat is made to form by dryness. The resin liquid which mixed the liquid which consists of a compound which has an epoxy group as heat-hardened type resin liquid, and epoxy groups including an amine and the compound to condense can be used. The resin liquid which added the well-known optical cationic initiator can be used for the compound which has the resin liquid which added the optical radical polymerization initiator well-known to the compound which has an acrylate machine, a methacrylate machine, an aryl group, etc. as optical hardening type resin liquid, a vinyl ether machine, and an epoxy group. In these resin liquid, additives, such as an ultraviolet ray absorbent and an antioxidant, can be added if needed.

[0019] In this invention, although it is made for the phase contrast value within a field of the diffusion sheet 70 to be set to 70nm or more 160nm or less or is made for the phase contrast value within a field of the layered product 80 of a light guide plate 62 and the diffusion sheet 70 to be set to 70nm or more 160nm or less, if it is organic polymeric materials in order to control the phase contrast value within a field of a diffusion sheet in this way for example, methods, such as the extending method and the annealing method, are employable. That is, extension can raise the phase contrast value within a field, and the phase contrast value within a field can be eased by annealing. Moreover, as for the diffusion sheet by this invention, it is desirable that the rate of haze is 95% or less 30% or more. All the light transmissions of a higher thing are [this diffusion sheet] still more desirable. That is, 70% or more of all light transmissions are desirable, and it is much more desirable that it is especially 85% or more 80 more% or more.

[0020] Although especially the thickness of a diffusion sheet is not restricted, in order to make thin polarization light equipment or a liquid crystal display, a diffusion sheet also has the thinner desirable one. However, since workability will become bad if too not much thin, it is usually at least 10 micrometers. It is desirable to have the thickness of a grade. Then, the thickness of a diffusion sheet is 10 micrometers. It is desirable that it is about 1,000 micrometers or less above, and it is 50 more micrometers. The above and 500 micrometers It is especially 200 micrometers hereafter. It is much more desirable that it is the following.

[0021] Although it is desirable to be formed from the transparent high polymer film of a monolayer as for the diffusion sheet by this invention, it may be formed from the multilayer transparent high polymer film for adjustment of the phase contrast value within a field. Although it is also good to carry out a laminating when multilayering, in order to reduce the loss of the light by the reflection produced in the interface of a high polymer film and air, it is desirable to use the method of carrying out thermocompression bonding and the method of pasting up with a pressure sensitive adhesive.

[0022] The light guide plate in this invention incorporates the light emitted from the light source inside, and functions as a field-like emitter. Such a light guide plate consists of plastics or glass, and what performed concavo-convex processing, white dot printing processing, and hologram processing to the tooth-back side can be used for it. Here, although especially the quality

of the material of plastics is not limited, a polycarbonate, a norbornene resin, a polymethylmethacrylate, etc. are used preferably. As a method of processing these polymeric materials into a light guide plate, a sheet plastic is formed by the extrusion method, the solvent cast method, or the pouring-in polymerization method, and the method of performing backing after cutting into a desired size, the method of slushing a melting macromolecule into a mold by the injection method, and fabricating, etc. can be adopted.

[0023] The phase contrast within a field of a light guide plate has a desirable method of a low, in order to prevent the curvature under an operating environment, and a strain. Furthermore, when considering as a layered product with a diffusion sheet, as for the sum of the phase contrast value within a field of the layered product, it is desirable that it is [70nm or more] 160nm or less, and it is especially much more desirable [the sum] 150nm or less 120nm or more and that it is especially 140nm or less 100 morenm or more. In addition, the light guide plate formed using the sheet fabricated by the pouring-in polymerization method is an especially desirable gestalt from the ability to perform a setup of the phase contrast value within a field only with a diffusion sheet while being able to prevent deformation, since the light guide plate independent phase contrast value within a field is set to about 0nm.

[0024] What is necessary is not to limit especially the kind of reflective sheet used in order to consider as light equipment combining these diffusion sheets and light guide plates, and just to choose it from what is used for usual polarization light equipment and a usual liquid crystal display suitably in this invention. That is, the sheet plastic which applied to the front face the white pigments like the white sheet plastic and titanium oxide in which the cavity was formed inside, or a zinc white, the multilayer sheet plastic which comes to carry out the laminating of at least two sorts of plastic film with which refractive indexes differ, the sheet which consists of a metal like aluminum or silver, the thing in which the coat of the metal like aluminum or silver was formed on the sheet plastic, etc. can be used. that by which mirror-plane processing of these sheets was carried out, and the thing by which split-face processing was carried out -- all are usable Especially the quality of the material of the sheet plastic which constitutes a reflecting plate is not limited, either, for example, polyethylene, polypropylene, a polyvinyl chloride, a polyethylene terephthalate, polyethylenenaphthalate, a polycarbonate, a norbornene resin, polyurethane, a polyacrylate, a polymethylmethacrylate, etc. can be used.

[0025] What is necessary is not to limit especially the kind of light source arranged at the edge of a light guide plate, either, but just to choose from what is used for usual polarization light equipment and a usual liquid crystal display suitably. Specifically, a cold cathode tube, light emitting diode, inorganic or organic EL (electroluminescent) lamp, etc. can be used.

[0026] As the light equipment 45 by this invention is shown in drawing 1 , it comes to arrange the reflective sheet 63, the light guide plate 62 with which the light source 61 has been arranged at the edge, and the diffusion sheet 70 at this order. Here, the diffusion sheet 70 may consist of one sheet, and may consist of two or more sheets. And from one standpoint, the phase contrast value within a field makes this diffusion sheet 70 70nm or more thing 160nm or less. Moreover, it is made for the phase contrast value within a field of the layered product 80 of a light guide plate 62 and the diffusion sheet 70 to be set to 70nm or more 160nm or less from another standpoint. For example, even if the phase contrast value within a field of diffusion sheet 70 the very thing is less than 70nm If the layered product 80 with a light guide plate 62 has the phase contrast value within a field of 70nm or more 160nm or less the effect of that is demonstrated, and if the phase contrast value within a field of diffusion sheet 70 the very thing is 70nm or more 160nm or less, even if the phase contrast value within a field of the layered product 80 of it and a light guide plate 62 exceeds 160nm, an appropriate effect will be demonstrated too In addition, when the phase contrast value within a field of the diffusion sheet 70 is large, in order to negate it, it is also possible to arrange so that an angle may be given between the lagging axis of a light guide plate 62 and the lagging axis of the diffusion sheet 70, for example, both lagging axis may intersect perpendicularly. Of course, the mode which is 70nm or more both 160nm or less has the phase contrast value within a field of the diffusion sheet 70, and the more desirable phase contrast value within a field of the layered product 80 of a light guide plate 62 and the diffusion sheet 70. As for the phase contrast value within a field of a layered product 80, it is much more desirable that it is especially 140nm or less that it is [150nm or less] especially 120nm or more again 100nm or more. Furthermore, because of prevention of the deformation under an operating environment, or brightness nonuniformity, as for the variation in the phase contrast value within a field of a layered product 80, it is desirable that it is 40nm or less, and it is much more desirable that it is especially 10nm or less 20 morenm or less.

[0027] It comes to arrange the optical element 50 which contains the reflected type linearly polarized light element 53 in a front-face [of the light equipment 45 which explained the polarization light equipment 40 by this invention in the top] 70, i.e., diffusion sheet, side. A reflected type linearly polarized light element here penetrates the linearly polarized light light of the specific oscillating direction, and reflects the linearly polarized light light which intersects perpendicularly with it. The reflected type linearly polarized light element which used the difference of the reflection factor of the polarization component by the brewster's angle as such a reflected type linearly polarized light element, for example (For example, a thing given in a ****** 6-508449 number official report), the reflected type linearly polarized light element which constructed the detailed metal-wire-like pattern The laminating of (for example, a thing given in JP,2-308106,A) and at least two sorts of high polymer films is carried out. The reflected type linearly polarized light element using the anisotropy of the reflection factor by the refractive-index anisotropy It has the sea island structure formed by at least two sorts of macromolecules into (for example, a thing given in a ****** 9-506837 number official report), and a high polymer film. The reflected type linearly polarized light element using the anisotropy of the reflection factor by the refractive-index anisotropy For example, (a thing given in a U.S. patent No. 5,825,543 specification), The reflected type linearly polarized light element which a particle distributes in a high polymer film and uses the anisotropy of the reflection factor by the refractive-index anisotropy An inorganic particle distributes in (for example, a thing given in a ****** 11 No. -509014 official report), and a high polymer film, and the reflected type

linearly polarized light element (for example, thing given in a publication-number 9-297204 number official report) using the anisotropy of the reflection factor based on the scattering power difference by size etc. can be used.

[0028] Although especially the thickness of these reflection type linearly polarized light element is not limited, when applying to a liquid crystal display etc., this polarizing element has the thinner desirable one, and they are specifically 1mm or less and 0.2 moremm. It is desirable that it is the following. Therefore, the reflected type polarizing element which carries out the laminating of at least two sorts of high polymer films, has sea island structure in the reflected type polarizing element using the anisotropy of the reflection factor by the refractive-index anisotropy and a high polymer film, and uses the anisotropy of the reflection factor by the refractive-index anisotropy is especially desirable in order to make thin thickness of the polarization light equipment concerning this invention.

[0029] In the polarization light equipment 40 of this invention, ****** of the reflected type linearly polarized light element 53 is arranged so that it may cross at 40-degree or more angle of 50 degrees or less to the lagging axis of the layered product 80 of a light guide plate 62 and the diffusion sheet 70. Here, when the polarization light of the specific oscillating direction carries out incidence of the ****** of the reflected type linearly polarized light element 53 to this polarizing element 53 perpendicularly, it means the sense of the polarizing element from which a polarizing element is rotated and the permeability of polarization light serves as the maximum. Moreover, the lagging axis of a layered product 80 means the sense with the largest refractive index within the field of this layered product 80. As for the angle of ****** of the reflected type linearly polarized light element 53, and the lagging axis of a layered product 80 to make, it is more desirable that it is [42 degree or more] 48 degrees or less, and it is most desirable that it is 45 more degrees.

[0030] In polarization light equipment 40, although an optical element 50 may consist of only reflected type linearly polarized light elements 53, when degree of polarization is low, desired polarizability is hard to be obtained, or it shines by outdoor daylight and a negative picture looms, contrast may be reduced only with the reflected type linearly polarized light element 53. Then, in such a case, the dichroism polarizing element 55 is arranged in the front face of the reflected type linearly polarized light element 53, and an optical element 50 can consist of these reflection type linearly polarized light element 53 and a dichroism polarizing element 55. At this time, the reflected type linearly polarized light element 53 and the dichroism polarizing element 55 are arranged so that both ****** may be in agreement on parenchyma. Thus, when using the dichroism polarizing element 55, the phase contrast element 56 is further arranged to the front-face side, it is these reflection type linearly polarized light element 53, the dichroism polarizing element 55, and the phase contrast element 56, and an optical element 50 can be constituted. Although it is also good to have carried out the laminating, as for the reflected type linearly polarized light element 53 and the dichroism polarizing element 55, from a viewpoint which reduces the loss of the light by interface reflection, it is desirable to stick both. For that purpose, the method of pasting up the reflected type linearly polarized light element 53 and the dichroism polarizing element 55 using a pressure sensitive adhesive is employable. It is the same when carrying out the laminating of the phase contrast element 56.

[0031] In the dichroism polarizing element 55 used here, it is the material which absorbs the linearly polarized light light which penetrates the linearly polarized light light of the specific oscillating direction, and intersects perpendicularly with it. As this dichroism polarizing element, a well-known iodine system polarization film and a color system polarization film can be used, for example. An iodine system polarization film is a film by which the extended polyvinyl alcohol film was adsorbed in iodine, and a color system polarization film is a film by which the extended polyvinyl alcohol film was adsorbed in the dichromatic dye. As for these polarization films, what covered the one side or both sides with plastic film for the improvement in endurance is desirable. As the quality of the material of the plastics covered for such protection, a diacetyl cellulose, a cellulose triacetate, a polyethylene terephthalate, a norbornene resin, etc. are mentioned. Although especially the thickness of the dichroism polarizing element 55 is not limited, when applying the polarization light equipment of this invention to a liquid crystal display element etc., the thinner one is desirable and it is desirable that they are specifically 1mm or less and 0.2 moremm or less. Moreover, when arranging the phase contrast element 56, the phase contrast film which is an oriented film of the polymeric materials generally known can be used.

[0032] It comes to arrange a liquid crystal cell 20 and the front photometry study element 30 containing the front-face side dichroism polarizing element 35 in this order at a front-face [of the polarization light equipment 40 which explained the liquid crystal display 10 by this invention in the top] 50, i.e., optical element, side. Here, an iodine system polarization film and a color system polarization film same with having explained previously as a dichroism polarizing element 55 by the side of a tooth back can be used for the front-face side dichroism polarizing element 35. In addition, the front photometry study element 30 may be the laminate of the front-face side dichroism polarizing element 35 and the front-face side phase contrast element 36. When arranging the front-face side phase contrast element 36, the phase contrast film same with having explained previously as a phase contrast element 56 by the side of a tooth back can be used. Between polarization light equipment 40 and a liquid crystal cell 20 and/or between a liquid crystal cell 20 and the front photometry study element 30, when pasting up using a pressure sensitive adhesive reduces the loss of the light by the reflection in an interface, it is desirable. Although especially the kind of pressure sensitive adhesive is not limited but various kinds of well-known things can be used, it is desirable to use an acrylate system pressure sensitive adhesive especially.

[0033] Liquid crystal 23 is poured in the same with having explained in drawing 2 into the cell by which the tooth-back side transparent electrode 21 and the front-face side transparent electrode 22 countered, and have been arranged, and the liquid crystal cell 20 which constitutes a liquid crystal display 10 is changing the orientation state of liquid crystal by voltage impression, and changes the state of the polarization light which penetrates the inside of a cell. TN (nematic [twist and]) liquid crystal cell well-known as such a liquid crystal cell, a TFT (TFT) drive TN liquid crystal cell, and In-Plane Nematic liquid

crystal cell and VA (perpendicular orientation) nematic liquid crystal cell, a STN (super-torsion -- nematic) liquid crystal cell, etc. can be used.

[0034]

[Example] Although an example explains the gestalt of concrete operation of this invention hereafter, this invention is not limited at all by these examples. In addition, the evaluation method in an example is as follows.

[0035] (1) All light transmissions and the rate sample of haze were cut off on 5cm square, and it measured by haze computer "HGM-2DP" (SUGA testing-machine incorporated company make).

[0036] (2) The phase contrast value sample was cut off on 4cm square, and it measured with the automatic birefringence meter "KOBRA-21ADH" (royal prince measuring machine machine incorporated company make).

[0037] (3) As shown to improvement ****** in brightness, and drawing 3 in a cross section, the light source 61 which becomes an edge from a cold cathode tube has been arranged, the reflecting plate 63 which is from Foaming PET (polyethylene terephthalate) on the tooth-back side of the light guide plate 62 which gave white dot printing 64 to the tooth back has been arranged, and light equipment 46 was produced. The light guide plate 62 cut out and produced the polymethylmethacrylate sheet of 8mm ** fabricated by the extrusion method, the phase contrast value within a field of this sheet center section was 8nm, and the lagging axis was a direction (cross direction) which intersects perpendicularly to the flow direction of a sheet. The iodine system polarization film "SR1862A" currently sold from Sumitomo Chemical Co., Ltd. as a dichroism polarizing element 55 on it is arranged so that the ****** may make the angle of 45 degrees to the long side of a light guide plate 62, and a pressure sensitive adhesive is minded on the dichroism polarizing element 55, and it is 1.1mm. The laminating of the glass plate 82 of ** was carried out, and the polarization light equipment 43 for contrast (control) was produced. And the photometry section 86 connected with the light-receiving section of a spectrophotometer by the optical fiber 87 has been arranged to the glass-plate 82 top perpendicular direction of the above-mentioned polarization light equipment 43. Since the bright line spectrums corresponding to the blue, green, and red of the cold cathode tube 61 used as the light source of polarization light equipment 42 were 435nm, 545nm, and 612nm, respectively, they measured the light-receiving intensity in such wavelength, and made it the criteria light-receiving intensity A in each wavelength.

[0038] As shown to drawing 4 in a cross section, between a light guide plate 62 and the dichroism polarizing element 55 separately the diffusion sheet 70 In the field which arranges so that the lagging axis may serve as the same direction as the lagging axis of a light guide plate 62, and faces the diffusion sheet 70 of the dichroism polarizing element 55 further The reflected type polarization film "DBEF" which consists of a layered product of two sorts of high polymer films currently sold from Sumitomo 3M, Inc. as a reflected type linearly polarized light element 53 Carrying out the laminating through the pressure sensitive adhesive so that the ****** might be in agreement with ****** of the dichroism polarizing element 55, others produced polarization light equipment 41 as well as the equipment of drawing 3 . The photometry section 86 connected to the glass-plate 82 top perpendicular direction of this polarization light equipment 41 by the optical fiber 87 with the light-receiving section of a spectrophotometer like drawing 3 has been arranged, and the light-receiving intensity B in 435nm which is a bright line spectrum corresponding to the blue, green, and red of a cold cathode tube 61, 545nm, and 612nm was measured. the ratio to the criteria light-receiving intensity A measured with the equipment of drawing 3 of the light-receiving intensity B at this time -- it had B/A and the improvement effect in brightness was evaluated

[0039] As an example of comparison 1 diffusion sheet 70, the improvement effect in brightness was evaluated using the diffusion film "light rise 125TD3" (136 micrometers of thickness, 90% of all light transmissions, 30% of rates of haze, phase contrast value within a field of 34nm) with which the coat of the optical diffusion layer was carried out to one side of the polycarbonate film base material currently sold from Kimoto, Inc. The light-receiving intensity ratio in each wavelength is shown in Table 1 with the phase contrast value within a field of a diffusion sheet, and the phase contrast value within a field of the layered product of a light guide plate and a diffusion sheet.

[0040] The improvement effect in brightness was evaluated using what carried out the laminating of the film made from a polycarbonate (143 micrometers of thickness, 92% of all light transmissions, 2% of rates of haze, phase contrast value within a field of 41nm) fabricated by the solvent cast method as an example 1 diffusion sheet 70 by "light rise 125TD3" used in the example 1 of comparison so that both lagging axis might serve as the same direction. The light-receiving intensity ratio in each wavelength is shown in Table 1 with the phase contrast value within a field of a diffusion sheet, and the phase contrast value within a field of the layered product of a light guide plate and a diffusion sheet.

[0041] The laminating of the two same films made from a polycarbonate as having used it in the example 2 example 1 carried out further using the pressure sensitive adhesive so that both lagging axis might serve as the same direction at lamination, and "light rise 125TD3" which used this two-sheet pasting polycarbonate film in the example 1 of comparison so that each lagging axis may serve as the same direction, and the improvement effect in brightness evaluated, using this laminating sheet as a diffusion sheet 70. The light-receiving intensity ratio in each wavelength is shown in Table 1 with the phase contrast value within a field of a diffusion sheet, and the phase contrast value within a field of the layered product of a light guide plate and a diffusion sheet.

[0042] The laminating of the three same films made from a polycarbonate as having used it in the example 3 example 1 carried out further using the pressure sensitive adhesive so that both lagging axis might serve as the same direction at lamination, and "light rise 125TD3" which used this three-sheet pasting polycarbonate film in the example 1 of comparison so that each lagging axis may serve as the same direction, and the improvement effect in brightness evaluated, using this laminating sheet as a diffusion sheet 70. The light-receiving intensity ratio in each wavelength is shown in Table 1 with the phase contrast value within a field of a diffusion sheet, and the phase contrast value within a field of the layered product of a light guide plate and a diffusion

sheet.
[0043] The laminating of the four same films made from a polycarbonate as having used it in the example of comparison 2 example 1 carried out further using the pressure sensitive adhesive so that both lagging axis may serve as the same direction at lamination, and "light rise 125TD3" which used this four sheet pasting polycarbonate film in the example 1 of comparison so that each lagging axis may serve as the same direction, and the improvement effect in brightness evaluated, using this laminating sheet as a diffusion sheet 70. The light-receiving intensity ratio in each wavelength is shown in Table 1 with the phase contrast value within a field of a diffusion sheet, and the phase contrast value within a field of the layered product of a light guide plate and a diffusion sheet.
[0044]
[Table 1]
---------- Example No. Diffusion sheet A light guide plate / diffusion sheet A light-receiving intensity ratio Phase contrast value within a field Phase contrast value within a field of a layered product 435 nm 545 nm 612 nm ---------- The example 1 of comparison 34 nm 42 nm 1.59 1.73 1.75 ---------- An example 1 75 nm 83 nm 1.63 1.76 1.78 ** 2 116 nm 124 nm 1.60 1.79 1.82 ** 3 157 nm 165 nm 1.541.79 1.83 ---------- Example 2 of comparison 198 nm206 nm 1.49 1.73 1.81---------- [0045] or [that the light-receiving intensity ratio is large and the examples 1-3 which have the phase contrast value within a field of a diffusion sheet within limits specified by this invention have the too small especially phase contrast value within a field of a diffusion sheet on the highest wavelength of 545nm of visibility that corresponds green as shown in Table 1] -- or compared with the too large examples 1 and 2 of comparison, the light-receiving intensity ratio is large When the phase contrast value within a field of a diffusion sheet and/or the phase contrast value within a field of the layered product of a light guide plate and a diffusion sheet are especially adjusted among 100nm - 150nm like an example 2, also in which wavelength equivalent to blue, green, and red, the light-receiving intensity ratio is large compared with the thing of the example of comparison. Therefore, by using this diffusion sheet, in polarization light equipment equipped with the reflected type linearly polarized light element, much more deployment of light can be aimed at, and improvement in the screen intensity of the liquid crystal display using it can be aimed at.
[0046] In addition, although the film made from a polycarbonate fabricated by the solvent cast method was stuck on the commercial diffusion film and the phase contrast value within a field of a diffusion sheet was adjusted to it in the upper example [whether the phase contrast value within a field of a diffusion sheet is adjusted using the film which adjusted the phase contrast value within a field by extension, and] Or if what gave diffusion process which an oriented film is made to contain the dispersing agent mentioned above, prepares a dispersing-agent layer, or is split-face-ized is used as a diffusion sheet, much more light-gage lightweight-ization can be attained.
[0047]
[Effect of the Invention] If the diffusion sheet of this invention is used, since the improvement effect in brightness by the reflected type linearly polarized light element can be heightened more, the screen where the same power consumption as the former is also brighter is obtained. for this reason -- for example, power consumption for obtaining the same screen intensity as the former can be lessened, and it becomes usable [a liquid crystal display prolonged by one dc-battery charge] Moreover, capacity of a dc-battery is made small and it also becomes possible to attain miniaturization and lightweight-ization of a liquid crystal display. Furthermore, light-gage lightweight-ization of the diffusion sheet itself can also be attained.

[Translation done.]